

## System and Method for Navigating Graphical Images

### BACKGROUND OF THE INVENTION

#### 1. Technical Field

The present invention relates in general to a system  
5 and method for navigating through graphical images. More  
particularly, the present invention relates to a system and  
method for scrolling through thumbnail images while  
maintaining a view of a larger master image.

#### 2. Description of the Related Art

10 Graphical navigation is increasing in popularity due  
to increased Internet connection speeds and increased  
processing ability of personal computers. Users retrieve  
many types of graphical images for viewing from the  
Internet, such and digital images and video clips and store  
15 them on personal computers.

A business web page or a user's personal file may  
include many graphical images. Thumbnail images are used  
in navigation applications in order to display many images  
concurrently. Thumbnail is a term used by graphic  
20 designers and photographers for a small image  
representation of a larger image, usually intended to make  
it easier and faster to look at or manage a group of larger  
images. For example, software that provides management of  
a multiple images often provides a miniaturized version of  
25 each image for use as a thumbnail.

Web sites with many pictures, such as online stores  
with visual catalogs, often provide thumbnail images

instead of larger images to make the page download faster. The user controls which images to view in full size. A user can view the thumbnails and decide to download and display a larger image of any of the thumbnails by  
5 selecting the desired thumbnail image(s).

Thumbnails may also be a cropped to show interesting portion of a larger image, rather than simply reducing the entire image. Depending upon the subject matter and size of the thumbnail, cropping an image to show an interesting  
10 portion may be an effective sales tool.

A challenge found with existing navigation applications is that navigation applications do not retain the view of the non-selected thumbnail images when the larger, selected image is displayed. Navigation  
15 applications may cover up the non-selected thumbnail images with a new window that includes a larger image of the selected thumbnail image. Or, navigation applications may display a larger image of the selected thumbnail image using the same navigation window in which case the user  
20 selects the "Back" button on the navigation application to return to the non-selected thumbnails. What is needed, therefore, is a way to view a larger selected thumbnail image while effectively retaining the view of the non-selected thumbnail images.

**SUMMARY**

It has been discovered that a screen display is effectively managed by having scrollable thumbnail images in one section of a display window and a larger, non-overlapping master image in different section of the same display window.

A user loads an initial display that includes a thumbnail table matrix and a larger, master image. The thumbnail table matrix shows many thumbnail images. The user may select different matrix sizes, such as a three by three matrix or a three by four matrix. An appropriate size of the thumbnail table matrix may depend on the size of the monitor and the resolution capability.

When a user selects a thumbnail image to view, a corresponding larger view of the image is displayed in the larger master image. If the thumbnail image is a cropped section of the complete image, the complete image will appear in the master image area.

The thumbnail table matrix has corresponding "Next" and "Back" buttons. The "Next" and "Back" buttons allow the user to scroll through thumbnail images while maintaining the view of the master image. The "Next" and "Back" buttons may be configured either in a horizontal mode or a vertical mode. In horizontal mode, selecting the "Next" button scrolls the thumbnails to the left and new thumbnails appear on the right column. The "Back" button scrolls the thumbnails to the right and new thumbnails appear on the left column. In vertical mode, selecting the "Next" button scrolls the thumbnails up and new thumbnails

appear on the bottom row. The "Back" button scrolls the thumbnails down and new thumbnails appear on the top row.

The user has various configuration settings. The user may change the resolution of the thumbnail images or master  
5 image. For example, the user may have an older monitor and high-resolution thumbnails and master image may take up too much display area. The user may also configure the system for "auto" mode and allow the system to determine the most appropriate resolution and thumbnail table matrix size.

10 In one embodiment, this invention may be used for video conferencing. In this embodiment, the thumbnails include a live video feed of each person attending the video conference, and the master image may be the person who is speaking or a feed selected by the user. In  
15 addition, as different individuals speak, the master image may change to display the corresponding video feed.

In another embodiment, this invention is used for viewing a training video. In this embodiment, each thumbnail includes a representation of a certain topic.  
20 The user selects the thumbnail topic of interest and the video topic selected is displayed in the master image. When the user is finished with the first topic, the user may select a different topic by selecting a new thumbnail instead of scanning through the entire training video.

25 The foregoing is a summary and thus contains, by necessity, simplifications, generalizations, and omissions of detail; consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects,

inventive features, and advantages of the present invention, as defined solely by the claims, will become apparent in the non-limiting detailed description set forth below.

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**BRIEF DESCRIPTION OF THE DRAWINGS**

The present invention may be better understood, and its numerous objects, features, and advantages made apparent to those skilled in the art by referencing the accompanying drawings. The use of the same reference  
5 symbols in different drawings indicates similar or identical items.

**Figure 1** is a diagram of a client accessing graphical images from a server;

10 **Figures 2A, B, and C** are changing displays of thumbnails and master images during button selections;

**Figure 3** is a high-level flowchart showing display changes from user selections;

15 **Figure 4** is a flowchart showing configurations changing;

**Figure 5** is a flowchart showing images shifting in response to the "next" and "back" button selections;

**Figure 6** is an example of a configuration change window; and

20 **Figure 7** is a block diagram of an information handling system capable of implementing the present invention.

**DETAILED DESCRIPTION**

The following is intended to provide a detailed description of an example of the invention and should not be taken to be limiting of the invention itself. Rather,  
5 any number of variations may fall within the scope of the invention which is defined in the claims following the description.

**Figure 1** is a diagram of a client accessing graphical images from a server. Client **100** accesses image store **150**  
10 information from server **140** through computer network **120**. Computer network **120** may be any network, such as the Internet, that allows computers to communicate with one another. Image store **150** may be a non-volatile storage area, such as a computer hard drive, and may include data  
15 such as images, video clips, or other multimedia information.

Client **100** loads thumbnail images and sends user change request **110** to computer network **120**. User change request **110** may be a request to retrieve more images or may  
20 be a request to change configurations. Computer network **120** sends change request **130** to server **140** for processing. Server **140** retrieves the data, such as image files, corresponding to the request from image store **150** and sends server change response **160** to computer network **120**.  
25 Computer network sends change response **170** to client **100** for processing.

Client **100** may initially access data information from image store **150** and store the data on an internal local storage area. In another embodiment, client **100** may have

data loaded directly on a local storage area. In this embodiment, client 100 may access its' internal storage area for new thumbnail images and configuration changes.

Figures 2A, B, and C are changing displays of thumbnails and master images during button selections. Figure 2A shows a display that includes master image 210, thumbnails 200, "back" button 215, "next" button 220, and configuration change button 290. Master image 210 shows a larger version of thumbnail 1 230. Any thumbnail in thumbnails 200 may be selected to display a larger version of the corresponding thumbnail in master image 210. For example, if a user selects thumbnail 4 235, a larger version of thumbnail 4 235 is displayed in master image 210.

The user selects "back" button 215 or "next" button 220 to change displayed thumbnail images. The current configuration of Figure 2A allows the user to scroll left or right to view different thumbnail images. In another embodiment, back button 215 and next button 220 may be used to scroll vertically up and down to view different thumbnail images. Configuration change button 290 allows the user to enter a configuration menu to change scroll modes among other configuration changes (see Figure 6 for an example configuration change screen).

Figure 2B shows a resulting display when a user selects "next" button 220 from Figure 2A. The rows in thumbnails 240 are shifted left. The first row is removed and a new row is displayed on the right. Master image 250 is not changed since the user has not selected a new thumbnail.



**Figure 2C** shows a resulting display when a user selects thumbnail **9 245** from **Figure 2B**. Master image **250** is refreshed and a larger version of thumbnail **9 245** is displayed in master image **260**. **Figures 2A, 2B, and 2C** display a three by three matrix of thumbnails. In another embodiment, the matrix may be a different configuration, such as a three by four matrix.

**Figure 3** is a high-level flowchart showing display changes from user selections. Processing commences at **300** whereupon images are retrieved from image store **315** and displayed on display **320** (step **310**). Image store **315** may be a local non-volatile storage area, such as a computer hard drive, or may be a remote storage location in server accessible through a computer network.

A user makes a selection at step **330** and a determination is made as to whether the selection is to change the configuration of the display (decision **340**). If the user requested a configuration change, decision **340** branches to "Yes" branch **342** whereupon the configuration change is processed (pre-defined process block **345**, see **Figure 4** for further details). On the other hand, if the selection is not a configuration change, decision **340** branches to "No" branch **348**.

A determination is made as to whether the user selected the "Next" or "Back" button (See buttons **215** and **220** in **Figure 2** for an example) to scroll thumbnail images (decision **350**). If the user selected the Next or Back button, decision **350** branches to "Yes" branch **352** whereupon the Next or Back button selection is processed (pre-defined process block **355**, see **Figure 5** for further details). On

the other hand, if the Next or Back button is not selected, decision **350** branches to "No" branch **358** whereupon the image corresponding to the selected thumbnail image is retrieved (step **360**). The retrieved image is displayed in  
5 master image **375** at step **370**.

A determination is made as to whether processing continues (decision **380**). If processing continues, decision **380** branches to "Yes" branch **382** which loops back to process the next user selection. This looping continues  
10 until processing terminates, at which point decision **380** branches to "No" branch **388**. The display window is closed at step **390**, and processing ends at **395**.

**Figure 4** is a flowchart showing configuration changes (See **Figure 6** for an example configuration change screen).  
15 Configuration change processing commences at **400**, whereupon a determination is made as to whether the user wants to change the thumbtable size (decision **410**). For example, the user may want to change the thumbtable size from a three by three matrix to a three by four matrix in order to  
20 view more thumbnails at once. If the user wants to change the thumbtable size, decision **410** branches to "Yes" branch **412** and the thumbtable size is updated per the user selection (step **415**) and processing returns at **460**

On the other hand, if the user does select the  
25 thumbtable size, decision **410** branches to "No" branch **418** whereupon a decision is made as to whether the user wants to change the resolution of the thumbnails (decision **420**). For example, the user may have a monitor with lower resolution and thus may wish to have lower resolution  
30 thumbnails displayed whereas a user using a high resolution

monitor may wish to increase the thumbnail resolution in order to see more thumbnail detail.

If the user wants to change the thumbnail size, decision **420** branches to "Yes" branch **422** whereupon the thumbnail size is changed per the user selection (step **425**) and processing returns at **460**. On the other hand, if the user does not select the thumbnail size, decision **420** branches to "No" branch **428** whereupon a determination is made as to whether the user wants to change the resolution of the master image (decision **430**). Using the example above, the user may have a low resolution monitor and the master image may be taking up too much screen area. Decreasing the master image resolution may free up room for other items, such as a larger thumbtable matrix size.

If the user wants to change the resolution of the master image, decision **430** branches to "Yes" branch **432** whereupon the master image resolution is changed per the user's request (step **435**) and processing returns at **460**. On the other hand, if the user does not want to change the master image resolution, decision **430** branches to "No" branch and a determination is made as to whether the user wants to change the scrolling method (decision **440**). The user may want to have the thumbnails scroll from top to bottom (vertically) instead of from left to right (horizontally) when the Back and Next buttons are selected.

If the user wants to change the scrolling method, decision **440** branches to "Yes" branch **442** whereupon the scrolling method is changed corresponding to the user's selection (step **445**) and processing returns at **460**. On the other hand, if the user does not want to change the

scrolling method, decision **440** branches to "No" branch **448** whereupon a determination is made as to whether the user wants to manually change configuration settings or have processing determine the most appropriate configuration settings based on system resources and automatically configure the display (decision **450**).

If the user wants to change the auto/manual selection, decision **450** branches to "Yes" branch **452** whereupon the auto/manual mode is changed corresponding to the user selection and processing returns at **460**. On the other hand, if the user does not want to change the auto/manual mode, decision **450** branches to "No" branch **458** and processing returns at **460**.

**Figure 5** is a flowchart showing images shifting in response to the "next" and "back" button selections. Image shift processing commences at **500**, whereupon a determination is made as to whether the system is in horizontal scrolling mode or vertical scrolling mode (decision **510**). If horizontal scrolling mode is configured, decision **510** branches to "Yes" branch **518** and the Next/Back button selections are processed in a horizontal scrolling method. On the other hand, if vertical scrolling is configured, decision **510** branches to "No" branch **512** and the Next/Back button selections are processed in a vertical scrolling method.

If vertical scrolling is configured, a determination is made as to whether the Next button or Back button is selected (decision **520**). If the next button is selected, decision **520** branches to "Yes" branch **528** whereupon a determination is made as to whether the end of the

thumbnail images are already displayed. If the end of the thumbnail images are already displayed, decision **540** branches to "Yes" branch **542** and the thumbnails are not shifted and processing returns at **580**. On the other hand, if the end of thumbnails are not already displayed, decision **540** branches to "No" branch **544** and the displayed thumbnails are shifted one row up (step **545**). For example, the bottom row moves to the second to bottom row, and newly displayed thumbnails encompass the bottom row and processing returns at **580**.

If vertical scrolling is configured and the Back button is selected, decision **520** branches to "No" branch **522** and a determination is made as to whether the beginning of the thumbnails are already displayed (decision **530**). If the beginning of the thumbnails are already displayed, decision **530** branches to "Yes" branch **532** and the thumbnails are not shifted and processing returns at **580**. On the other hand, if the beginning of the thumbnails are not already displayed, decision **530** branches to "No" branch **534** whereupon the displayed thumbnails are shifted one row down (step **535**). For example, the top row moves to the second to top row, and new thumbnails encompass the top row and processing returns at **580**.

If horizontal scrolling is configured, a determination is made as to whether the Next button or Back button is selected at decision **550**. If the next button is selected, decision **550** branches to "Yes" branch **558** whereupon a determination is made as to whether the end of the thumbnail images are already displayed. If the end of the thumbnail images are already displayed, decision **570** branches to "Yes" branch **572** and the thumbnails are not

shifted and processing returns at **580**. On the other hand, if the end of thumbnails are not already displayed, decision **570** branches to "No" branch **574** and the displayed thumbnails are shifted one column left (step **575**). For example, the right column moves to the second to right column, and newly displayed thumbnails encompass the right column and processing returns at **580**.

If horizontal scrolling is configured and the Back button is selected, decision **550** branches to "No" branch **552** and a determination is made as to whether the beginning of the thumbnails are already displayed (decision **560**). If the beginning of the thumbnails are already displayed, decision **560** branches to "Yes" branch **562** and the thumbnails are not shifted and processing returns at **580**. On the other hand, if the beginning of the thumbnails are not already displayed, decision **560** branches to "No" branch **564** whereupon the displayed thumbnails are shifted one column right (step **565**). For example, the left column moves to the second to left column, and new displayed thumbnails encompass the left column.

**Figure 6** shows a configuration change window. Configuration change window **600** includes selections for a user to configure a navigation screen. The user may change the thumbtable matrix size by entering a matrix size configuration in text box **605** and text box **610**. For example, the user may have a large, high resolution monitor and may enter an "8" in text box **605** and text box **610** to display an eight by eight thumbtable matrix.

A user may change the resolution of the thumbnails by entering the pixel resolution in text box **615** and text box

620. The user may also change the resolution of the master image by entering the pixel resolution in text box 625 and text box 630. The user may decide to change the resolution of the thumbnails and the master image depending upon the size and resolution of his monitor.

Horizontal or vertical scroll mode may be chosen. Selecting radio button 635 chooses horizontal scroll mode which enables the thumbtable matrix to scroll left and right when the "Back" and "Next" buttons are selected. Selecting radio button 640 chooses vertical scroll mode which enables the thumbtable matrix to scroll up and down when the "Back" and "Next" buttons are selected.

The user may decide to have the computer system determine the most appropriate configuration by selecting radio button 645. Selecting radio button 645 configures the computer system to automatically configure the thumbtable size, the thumbnail resolution, and the master image resolution. The user may still have the ability to select scroll mode in automatic configuration.

After configuration selection, the user selects command button 655 to apply the selected changes and close configuration change window 600. The user may select command button 660 to cancel his configuration changes and close configuration change window 600. If the user needs help with the contents of configuration change window 600, the user selects command button 665 to access a configuration change help menu.

Figure 7 illustrates information handling system 701 which is a simplified example of a computer system capable of performing the server and client operations described

herein. Computer system **701** includes processor **700** which is coupled to host bus **705**. A level two (L2) cache memory **710** is also coupled to the host bus **705**. Host-to-PCI bridge **715** is coupled to main memory **720**, includes cache memory and main memory control functions, and provides bus control to handle transfers among PCI bus **725**, processor **700**, L2 cache **710**, main memory **720**, and host bus **705**. PCI bus **725** provides an interface for a variety of devices including, for example, LAN card **730**. PCI-to-ISA bridge **735** provides bus control to handle transfers between PCI bus **725** and ISA bus **740**, universal serial bus (USB) functionality **745**, IDE device functionality **750**, power management functionality **755**, and can include other functional elements not shown, such as a real-time clock (RTC), DMA control, interrupt support, and system management bus support. Peripheral devices and input/output (I/O) devices can be attached to various interfaces **760** (e.g., parallel interface **762**, serial interface **764**, infrared (IR) interface **766**, keyboard interface **768**, mouse interface **770**, and fixed disk (HDD) **772**) coupled to ISA bus **740**. Alternatively, many I/O devices can be accommodated by a super I/O controller (not shown) attached to ISA bus **740**.

BIOS **780** is coupled to ISA bus **740**, and incorporates the necessary processor executable code for a variety of low-level system functions and system boot functions. BIOS **780** can be stored in any computer readable medium, including magnetic storage media, optical storage media, flash memory, random access memory, read only memory, and communications media conveying signals encoding the instructions (e.g., signals from a network). In order to



attach computer system **701** to another computer system to copy files over a network, LAN card **730** is coupled to PCI bus **725** and to PCI-to-ISA bridge **735**. Similarly, to connect computer system **701** to an ISP to connect to the Internet using a telephone line connection, modem **775** is connected to serial port **764** and PCI-to-ISA Bridge **735**.

While the computer system described in **Figure 7** is capable of executing the invention described herein, this computer system is simply one example of a computer system. Those skilled in the art will appreciate that many other computer system designs are capable of performing the invention described herein.

One of the preferred implementations of the invention is an application, namely, a set of instructions (program code) in a code module which may, for example, be resident in the random access memory of the computer. Until required by the computer, the set of instructions may be stored in another computer memory, for example, on a hard disk drive, or in removable storage such as an optical disk (for eventual use in a CD ROM) or floppy disk (for eventual use in a floppy disk drive), or downloaded via the Internet or other computer network. Thus, the present invention may be implemented as a computer program product for use in a computer. In addition, although the various methods described are conveniently implemented in a general purpose computer selectively activated or reconfigured by software, one of ordinary skill in the art would also recognize that such methods may be carried out in hardware, in firmware, or in more specialized apparatus constructed to perform the required method steps.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that, based upon the teachings herein, changes and modifications may be made without departing from this invention and its broader aspects and, therefore, the appended claims are to encompass within their scope all such changes and modifications as are within the true spirit and scope of this invention. Furthermore, it is to be understood that the invention is solely defined by the appended claims. It will be understood by those with skill in the art that if a specific number of an introduced claim element is intended, such intent will be explicitly recited in the claim, and in the absence of such recitation no such limitation is present. For a non-limiting example, as an aid to understanding, the following appended claims contain usage of the introductory phrases "at least one" and "one or more" to introduce claim elements. However, the use of such phrases should not be construed to imply that the introduction of a claim element by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim element to inventions containing only one such element, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an"; the same holds true for the use in the claims of definite articles.